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ABSTRACT

The question of whether clinical teaching skills could be improved during the first 2 years of postgraduate medical education was studied with 23 residents. Nine of the residents were the control group who received no instruction/feedback. The 14 residents in the experimental group completed a half-day workshop that included lecture and discussion of teaching skills and role-playing. The experimental group residents also made two videotapes of teaching encounters and critiqued their videotapes with supervisors. Residents who did not attend the workshop made two videotapes during the same time period, but received no critique or feedback. Trained raters used videotapes to rate teaching skills of all 23 residents, with attention to: communicating objectives, directing attention during the case presentation, formulating the differential diagnosis, expanding the case, managing the case, giving feedback, learning climate, and overall teaching quality. Resident's clinical teaching skills improved with instruction and feedback but declined after instruction ceased. Periodic reinforcement is recommended to maintain improved teaching skills. (SW)

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Teaching Residents to Teach Medical Students: An Experimental Study

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Introduction

Residents have traditionally been perceived as learners and deliverers of patient care although they also teach both medical students and patients. The role of residents as teachers is now beginning to gain recognition (Edwards and Marier, in press). Medical schools are realizing that the large number of contact hours between residents and students can be a fertile environment for both sets of learners if residents use principles of learning derived from theory and research. Programs to improve residents' teaching have been reported (Jewett et al, 1982, Camp et al, 1985; Lawson & Harvill, 1980; Meleca & Schimpfhasuser, 1976), but little is known of their effectiveness.

Little evaluation of the effects of faculty development programs in the health professions has been conducted (Stritter, 1983). Behavioral and knowledge changes as a result of faculty development programs have rarely been studied scientifically. More is known about the characteristics of medical teachers, attitudes, and role-modeling. Only one study has evaluated short and long term effects of a teacher-training workshop in a medical school (Mahler & Benor, 1984).

An experimental study, therefore, was undertaken to determine if the teaching behaviors of residents could be improved through instruction. The research question was, "Can residents improve their clinical teaching skills through instruction during the first two years of postgraduate medical education?"

Support for this study was provided by the National Fund for Medical Education.

Developmental theory underlies this study. Residents are on a steep learning curve during the first two years of residency. Growth in several areas is evident: cognition, technical skills, attitudes, psychosocial characteristics, independent learning, socialization, teaching. Stritter et al (in press) explain this concept of professional development in more depth. Giving instruction in teaching skills during this time could capitalize on residents' developing competence. On the other hand, residents may become more competent teachers during this time simply because they acquire more knowledge and skills with which to teach. Other factors may influence teaching as well. This study was designed to investigate the possibility of improving residents' teaching skills through instruction.

Method

Subjects

All residents in their first year of postgraduate medical education in the departments of Medicine, Family Medicine, and Obstetrics and Gynecology in the 1984-85 term were required to participate in a study of resident teaching skills. Thirty-five residents began the study; ten were lost through attrition from their residency programs; two refused to cooperate during the second year of the study. Twenty-three residents completed the study; 14 were in the experimental group and 9 in the control group; six were female, and 17 were male. The director of each program randomly assigned the residents to either the control or experimental group and then checked both groups for equivalence in clinical competence.

Procedure

Design. A repeated measures experimental design was used. The experimental group received instruction, critique, and feedback about their teaching skills throughout years one and two of their residency program. The control group received no instruction or feedback. Both groups were evaluated three times: in the first year before the instructional program (Phase I), in the second year during the instructional program (Phase II), and in the third year six months after the instructional program (Phase III). The following measures were collected at each of the three phases: trained raters' evaluations of videotaped teaching performance; residents' self-ratings on the Inventory of Teaching Behavior (Irby, 1978); student ratings of resident teaching performance. An open-ended questionnaire was administered to the control and experimental residents at the end of the study. This paper reports only the results of the videotaped teaching performance.

The instructional program for the experimental group consisted of (1) a one-half day introductory workshop (Year 1) and (2) critique with feedback of videotaped teaching encounters (Year 2). Spacing the instruction over a twelve month period from the middle of the first year through the middle of the second year meant that the residents received periodic reinforcement about teaching during the time they were on the steep learning curve for medical knowledge and skill.

The workshop introduced the first year experimental residents to seven general principles of clinical teaching. The workshop included small group discussions of teaching skills, an interactive lecture, and

role-playing to practice teaching principles. Table 1 displays the types of sessions and the content of the workshop. A team consisting of a residency director, an educator, and several senior residents selected for their outstanding clinical competence and teaching ability conducted the workshop. A more complete description of this workshop can be found in Edwards et al(1987).

During Phase II of the study, each member of the experimental group made two videotapes of teaching encounters with third-year students and critiqued their videotapes with the residency director and the education consultant. Each control resident made two videotapes during the same time period, but received no critique or feedback. The videotaped encounters consisted of a student presenting a patient case to a resident and a discussion about the case. The critiques for the experimental residents focused on three of the seven principles of clinical teaching introduced in the workshop: communicating objectives, giving feedback, and directing attention. Directing attention included a cluster of skills to teach students how to formulate a differential diagnosis, manage a patient case, and expand the individual case to more general principles (transfer of learning).

Concern about contamination between the two groups stimulated a precautionary method. After each critique session, the residents who were members of the experimental group were told not to discuss these teaching techniques with persons not in the room at that time.

Videotaping Procedure. Videotaping was accomplished in each of the three phases of the study. More than one videotape was made in each time phase to increase the reliability of sampling teaching behavior. A

stipend of twenty-five dollars was paid to each resident for completion of each of these three phases of the study.

The videotapes were made in a standardized setting of a conference room containing chairs, a table, a chalkboard, and the videotape equipment. The residents were told to try to keep the encounter to fifteen or twenty minutes, but regardless of the length, the entire encounter was taped. Only the first fifteen minutes of each tape were evaluated by the raters, however.

The residents were told only to teach the student about the patient case and how to present a patient case. The video technician told each resident and student, "This is a teaching and learning encounter. We want you to do this just as you would on the wards." If the resident asked what he/she should do, the technician replied, "Teach both how to present a patient and the content about this particular patient case."

Instruments

The student's overall performance and the residents' teaching behaviors were evaluated on a Likert scale of 1 (low) to 6 (high) with behavioral anchors. The resident's behaviors were rated on the following scales: Communicating Objectives, Directing Attention During the Case Presentation, Formulating the Differential Diagnosis, Expanding the Case (transfer of learning), Managing the Case, Giving Feedback, Learning Climate, and Overall Teaching Quality. Overall Teaching Quality was not a mathematical average of the other scales, but was a separate, holistic

judgement about the quality of teaching performance.

Psychology graduate students, who were blind to group assignment (experiment or control), rated the videotapes. Each tape was rated independently by two graduate students. Each tape was viewed by each rater at least three times. The raters were trained by an educator and two physicians.

Intrarater Reliability.

The consistency of the raters (intrarater reliability) was checked by having each rater periodically rate tapes a second time. Paired t-tests were computed on each rater's two ratings of the scales. Potential biases by specialty and by treatment group (control or experimental) were also examined. No significant biases were found.

Interrater Reliability. The raters' reliability was checked by computing Pearson Product Moment correlations between their scores on the same tapes. This was done during the training period and several times during the study. Table 2 reports the correlations computed on the entire set of videotapes. All correlations were statistically significant.

Validity Study. Three physicians worked with the educator and graduate students for seven months to develop the evaluation instruments and procedures. After the instruments and procedures were finalized, a formal validity study was conducted. Comparisons were made among ratings of a physician and three non-physician researchers on seven videotapes. The four raters viewed each tape together twice. The following criteria for validity were established before any of the tapes were viewed: (1)

raters must agree that the rating is either negative (points 1,2,3 on the scales) or positive (points 4,5, and 6 on the scales); (2) ratings must be no more than one point apart. Of the 385 possibilities for agreement/disagreement (11 scales x 5 comparisons x 7 tapes), 358 pairs of ratings (93%) agreed, either negative or positive. Of 308 ratings, (11 scales x 4 raters x 7 tapes) only 13 (4%) were more than one point apart; thus 96% of the ratings met this criterion.

Statistical Analyses. The two raters' scores on each scale for each tape were averaged. These average scores were analyzed by two sample t-tests comparing control and experimental groups within each of the three time phases; and by paired t-tests on the differences between mean scores for control and experimental groups separately. Specialty differences were analyzed by two-way analysis of variance and Duncan's multiple-range test. Regression analysis was done to determine which scales best predicted the Overall Teaching Quality and the amount of variance accounted for by each scale.

Results

Did teaching skills improve within each group between the phases? Table 3 presents the means and standard errors of the mean on the eight scales for the experimental and control residents during the three phases of the study (pre-instruction, during instruction, post-instruction). Perusal of the raw scores in Table 3 shows that the experimental scores increased on all but one scale (Management) during instruction, but declined after instruction on all scales except Formulating a Differential Diagnosis. The control group's scores increased on five of the eight scales in Phase II. In Phase III, however, scores on five scales declined and three increased.

Mean differences between the phases for each group separately were analyzed by paired t-tests. The mean rating on Overall Teaching Quality for the experimental group significantly increased ($p. < 0.03$) from pre-instruction (Phase I) to during instruction (Phase II). The increase in mean rating for the experimental group from Phase I to Phase II on Directing Attention During A Case Presentation approached significance ($p < 0.06$). From Phase II to Phase III in the experimental group, there were no significant differences.

In the control group, none of the increases from Phase I to Phase II were significant. The declines from Phase II to Phase III were statistically significant ($p < 0.05$) on Formulating a Differential Diagnosis and Management.

The question "How do the experimental residents compare with control residents?" was also asked. Inspection of the raw scores in Table 3 shows that during and after instruction, the ratings of the experimental group were higher (although not significant) than those of the control group on all scales, with two exceptions. In Phase III, the experimental and control groups' ratings on Management are the same; the control group's rating on Feedback was higher than that of the experimental group. Figure 1, Formulating A Differential Diagnosis, illustrates the trend of higher scores for the experimental group.

The ratings of both groups were analyzed by two-sample t-tests. Before instruction (Phase I), the experimental group was rated significantly higher than the control group on Expanding the Case. The control group, on the other hand, was significantly higher on Feedback.

There were no other significant differences between the two groups on the pre-instruction data.

The two sample t-tests revealed that during instruction, the ratings for the experimental residents were significantly higher on the scales Communicating Objectives, Directing Attention During the Case Presentation, Expanding the Case and Overall Teaching Quality ($p < .05$). The pre-instruction differences on Expanding the Case may account for the difference during instruction. The experimental group improved its scores on Feedback during instruction, but these were not significantly higher than the control group.

Analysis of the Phase III ratings between the two groups revealed that the experimental group retained significantly higher scores on Communicating Objectives, but on no other scales. Figures 2 through 5 illustrate the differences between the two groups at the three time intervals on the scales Communicating Objectives, Directing Attention, Expanding the Case, and Overall Teaching Quality. Figures 6 through 13 are bar graphs of the means plus and minus two standard errors of the mean of the eight scales.

The question, "Were there differences among the three specialties?" was also of interest. Differences were found among the three specialties of Medicine, Family Medicine, and Obstetrics and Gynecology. In general, Obstetrics and Gynecology residents taught differently than Medicine and Family Medicine residents although the scores were not consistently different statistically. Obstetrics and Gynecology residents were rated higher than Medicine or Family Medicine residents on Feedback before and during instruction. On Formulating A Differential Diagnosis, however, Obstetrics and Gynecology residents were rated significantly lower ($p < 0.05$) than Medicine and Family Medicine residents before and during instruction.

Regression analysis indicated that Expanding the Case was the best predictor of Overall Teaching Quality. This scale accounted for 41% of the total variance (R) of the Overall Teaching Quality. Learning Climate, Differential Diagnosis, Directing the Case Presentation, and Management were also significant predictors of Overall Teaching Quality, accounting for a total of 63% of the total variance.

Discussion

These data suggest that teaching skills improved in the experimental group as a result of the instructional program. The experimental residents, who received instruction about teaching in clinical settings, were rated higher on all the teaching behaviors during the phase of instruction than residents receiving no instruction. The Overall Teaching Quality is the single most important rating because it reflects a judgement about the quality of the teaching performance considered as a whole. The experimental group scored higher than the controls on this measure both during and after instruction. The control group, in contrast, remained at approximately the same level on Overall Teaching Quality throughout the three phases.

The experimental residents' improvement in teaching skill, however, declined after instruction ceased. Six months after instruction, their teaching skills were rated lower than they had been during instruction although they were higher than the pre-instruction measure on five of the eight skills. One might deduce that periodic reinforcement would be necessary to maintain improved teaching skills throughout the residency training period.

The performance of the control group across the eight teaching scales is interesting. On four of the eight scales, including Overall Teaching Quality, the control residents' scores remained about the same or declined during the three phases. On three scales, the control residents increased, but not significiantly so, during the three phases. On Feedback the control residents' scores remained about the same in Phases I and II, but in Phase III, they improved dramatically. One may conclude that the third year residents in the control group realized the importance of this behavior for learning and were able to give more feedback because of their increased clinical competence.

In general, there was less increase and greater decline in control than in experimental scores across the three phases. Perhaps this is evidence of another facet of resident "burn-out". Factors such as general fatigue, impatience with the study, or loss of interest in students may have contributed to their performance. These results suggest that without support for their teaching function, residents' teaching skills do not improve directly in relation to their increasing clinical competence.

Conclusion

This study has demonstrated that residents' clinical teaching skills can be improved by instruction; however, the skills declined after six months. Without instruction, residents' teaching skills in general do not improve although giving feedback may be an exception.

Camp, M.G., Hoban, J.D., & Katz, P. (1985). A course on teaching for house offcers, Journal of Medical Education, 60, 140-142.

Edwards, J.C., Kissling, G.E., Plauche', W.C., & Marier, R.L. (1987). Developing and evaluating a teaching improvement program for residents. In J.C. Edwards & R.L. Marier (Eds.), Clinical teaching for medical residents: Roles, techniques, and programs. New York: Springer Publishing Company.

Edwards, J.C., & Marier, R.L. (Eds.). (1987). Clinical teaching for medical residents: Roles, techniques, and programs. New York: Springer Publishing Company.

Irby, D.M. (1978). Clinical teacher effectiveness in medicine. Journal of Medical Education, 53, 808-815.

Jewett, L.S., Greenberg, L.W., & Goldberg, R.M. (1982). Teaching residents how to teach: A one-year study. Journal of Medical Education, 57(5), 361-366.

Lawson, B.K. & Harvill, L.M. (1980). The evaluation of a training program for improving residents' teaching skills. Journal of Medical Education, 55, 1001-1005.

Mahler, S. & Benor, D.E. (1984). Short and long-term effects of a teacher-training workshop in medical school. Higher Education, 13, 265-273.

Melecca, B.C. & Schimpfhauser, F.T. (1976). A house staff training program to improve the clinical instruction of medical students. Columbus, Ohio: Ohio State University, College of Medicine. (ERIC Document Reproduction Service No. ED203787).

Stritter, F.T. (1983). Faculty evaluation and development. In McGuire, C.H., Foley, R.P., Gorr, A., & Richards, R.W. (Eds.), Handbook of Health Professions Education. San Francisco: Jossey-Bass Publishers.

Stritter, F.T., Shahady, E.J., & Mattern, W.D. (1987). The resident as a professional and teacher: A developmental perspective. In J.C. Edwards & R.L. Marier (Eds.), Clinical teaching for medical residents: Roles, techniques, and programs, New York: Springer Publishing Company.

Table 1

Workshop on Clinical Teaching Skills

Session 1

Purposes: 1) For residents to think about teaching techniques

2) For the teachers to assess residents' awareness of teaching

Instructional Method: Small-group discussions followed by reports to the entire group

Time: 30 minutes

Session 2

Purposes: 1) To provide a framework for organizing ideas about clinical teaching

2) To present educational principles that residents can apply in clinical settings

3) To model the educational principles on videotape and in the teachers' live performances

Instructional Method: Team lecture with discussion illustrated with videotapes

Content: Educational Principles

Communicating Objectives

Communicating with Patients and Learners

Motivating

Directing Attention

Teaching Clinical/Surgical Procedures

Giving Feedback

Evaluating

Time: 1 1/2 Hours

Session 3

Purposes 1) To give practice with feedback

2) To allow discussion between participants and senior residents on the teaching team

Instructional Method: Role-playing student cases:
- A disorganized student
- An excellent student
- A student needing to learn to perform a clinical procedure

Time: Three or four 20 minute sessions

Table 2

Interrater Reliability

Pearson-Product Moment Correlations

Scale	Correlation
Communicating Objectives	0.90
Directing Case Presentations	0.41
Diagnosis	0.67
Expanding the Case	0.68
Management	0.68
Feedback	0.76
Learning Climate	0.45
Overall	0.64

n=16

All correlations are statistically significant ($p < 0.001$).

Table 3. Means and Standard Errors of the Mean of Eight Teaching Scales for Experimental and Control Residents During Three Time Phases

Teaching Scale	Experimental Group			Control Group		
	Phase I (n=29)	Phase II (n=37)	Phase III (n=13)	Phase I (n=19)	Phase II (n=32)	Phase III (n=13)
Com. Obj.	2.02(0.75)	2.66(0.30)*	3.29(0.44)***	1.00(0.00)	1.47(0.20)*	1.20(0.20)***
Dir. Case Pre.	3.93(0.08)	4.15(0.08)*	4.14(0.20)	3.93(0.07)	3.76(0.14)*	3.89(0.19)
Diff. Diag.	3.09(0.30)	3.44(0.23)	3.55(0.31)	3.30(0.19)	3.21(0.17)+	2.87(0.25)
Expanding	3.81(0.20)*	3.97(0.18)**	3.54(0.33)	3.04(0.28)*	3.11(0.20)**	3.31(0.26)
Management	3.34(0.26)	3.31(0.23)	2.47(0.34)	3.59(0.28)	3.12(0.19)+	2.47(0.35)
Feedback	1.81(0.21)*	3.22(0.28)	3.08(0.49)	2.72(0.32)*	3.00(0.28)	3.71(0.45)
Climate	4.52(0.12)	4.57(0.12)	4.44(0.14)	4.19(0.13)	4.32(0.15)	4.05(0.25)
Overall	3.82(0.16)+	4.24(0.13)***	3.92(0.20)	3.43(0.18)	3.47(0.14)***	3.46(0.20)

Paired t-tests

+ Significant increase or decrease within group between phases at $p < 0.05$

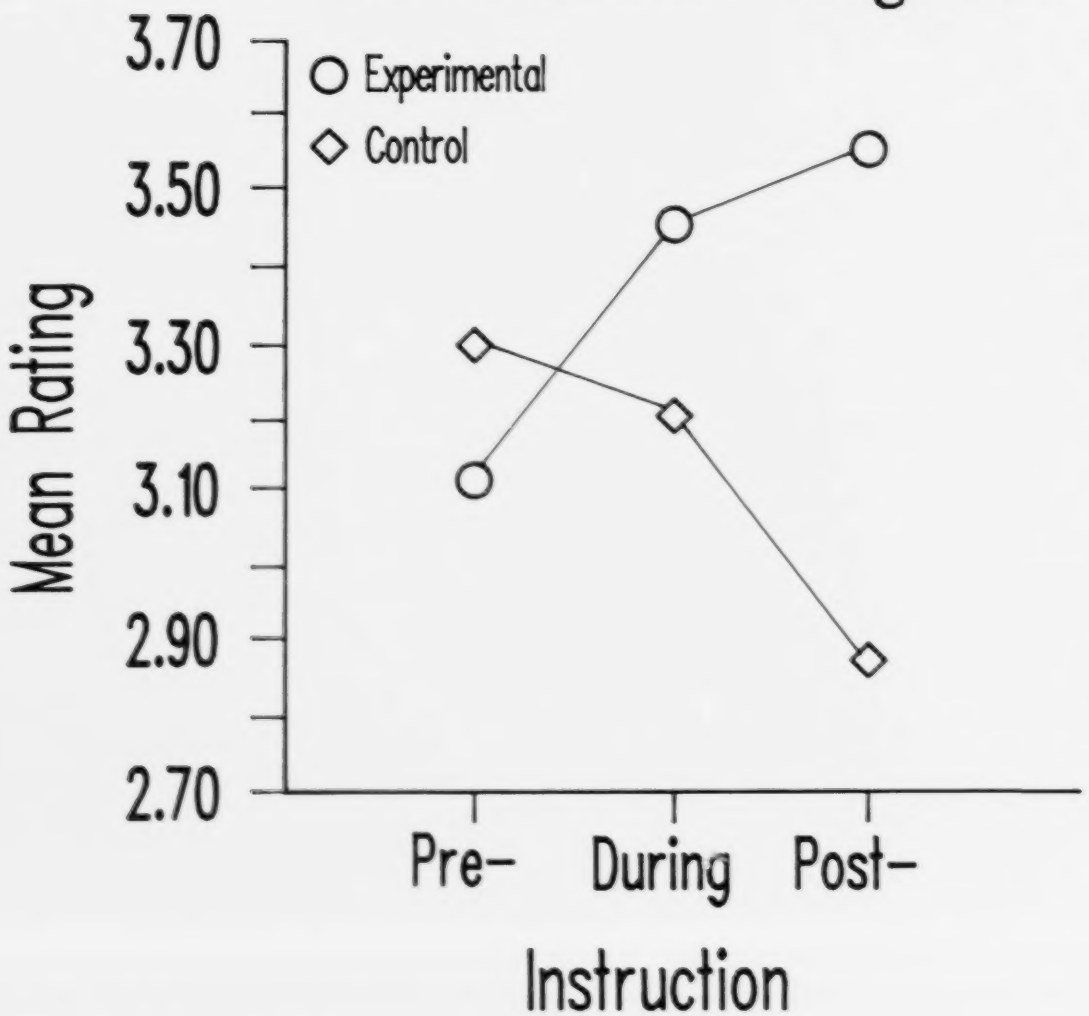
Two-Sample t-tests

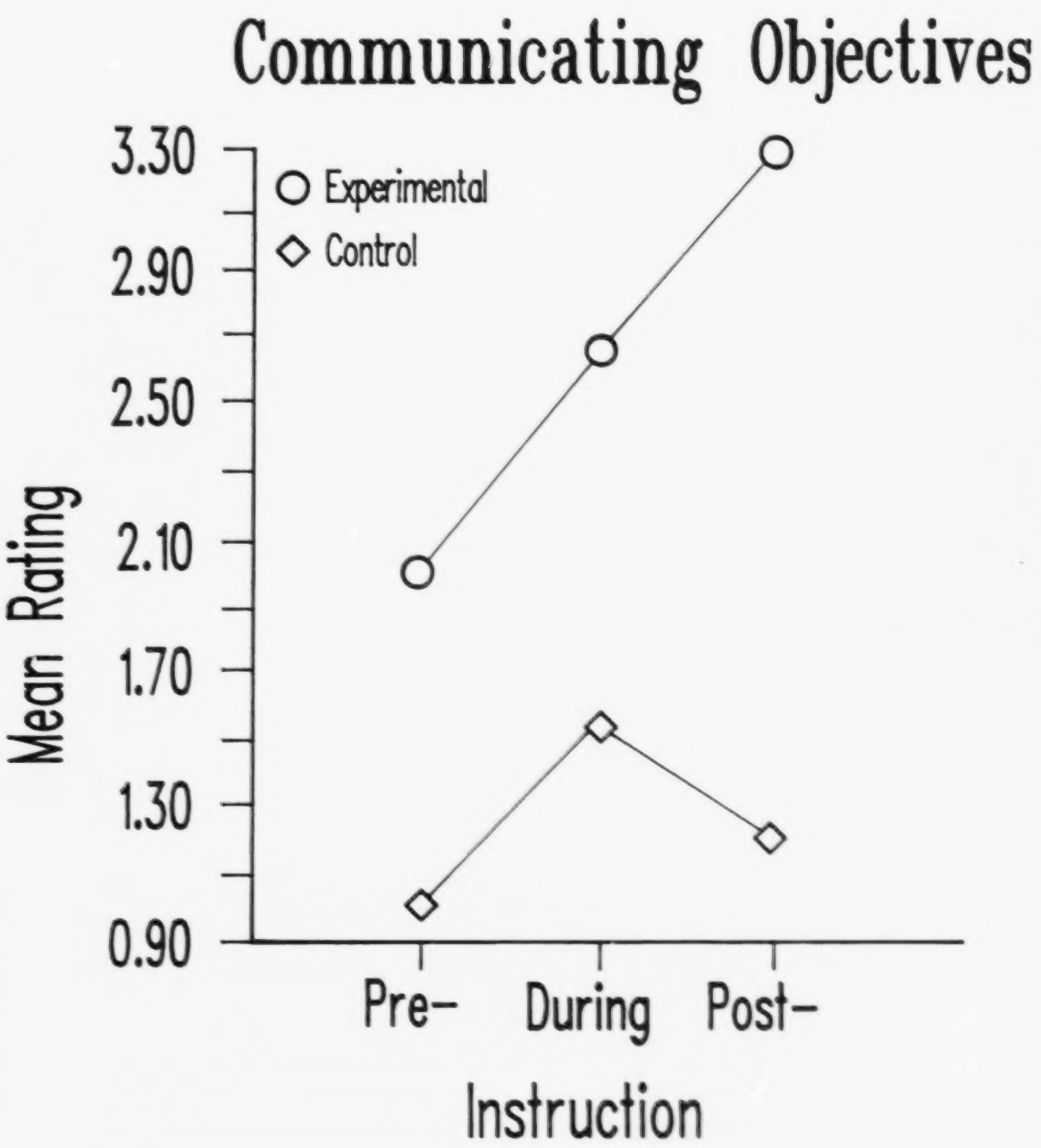
* Experimental and control groups are significantly different at $p < 0.05$

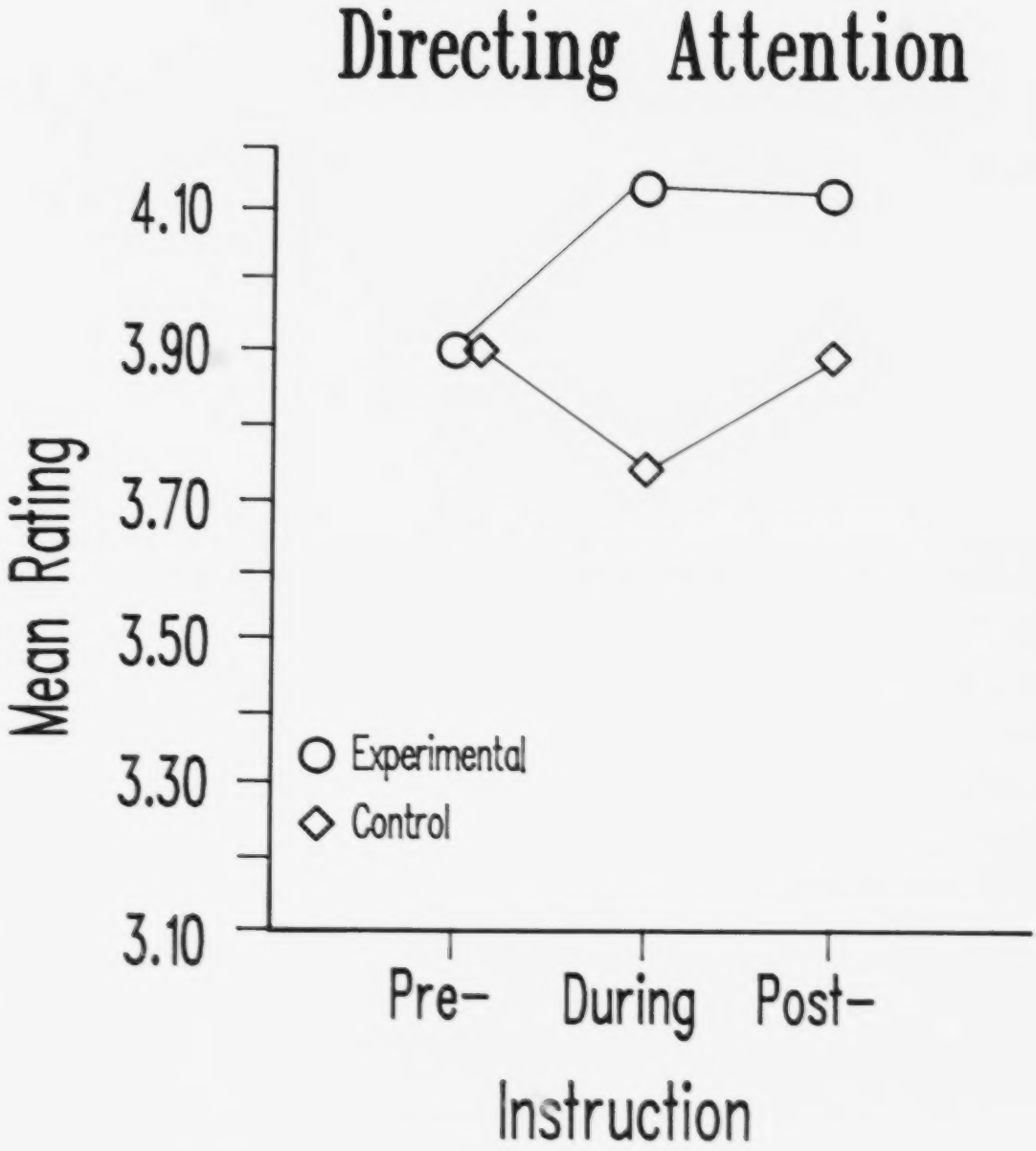
** Experimental and control groups are significantly different at $p < 0.01$

*** Experimental and control groups are significantly different at $p < 0.001$

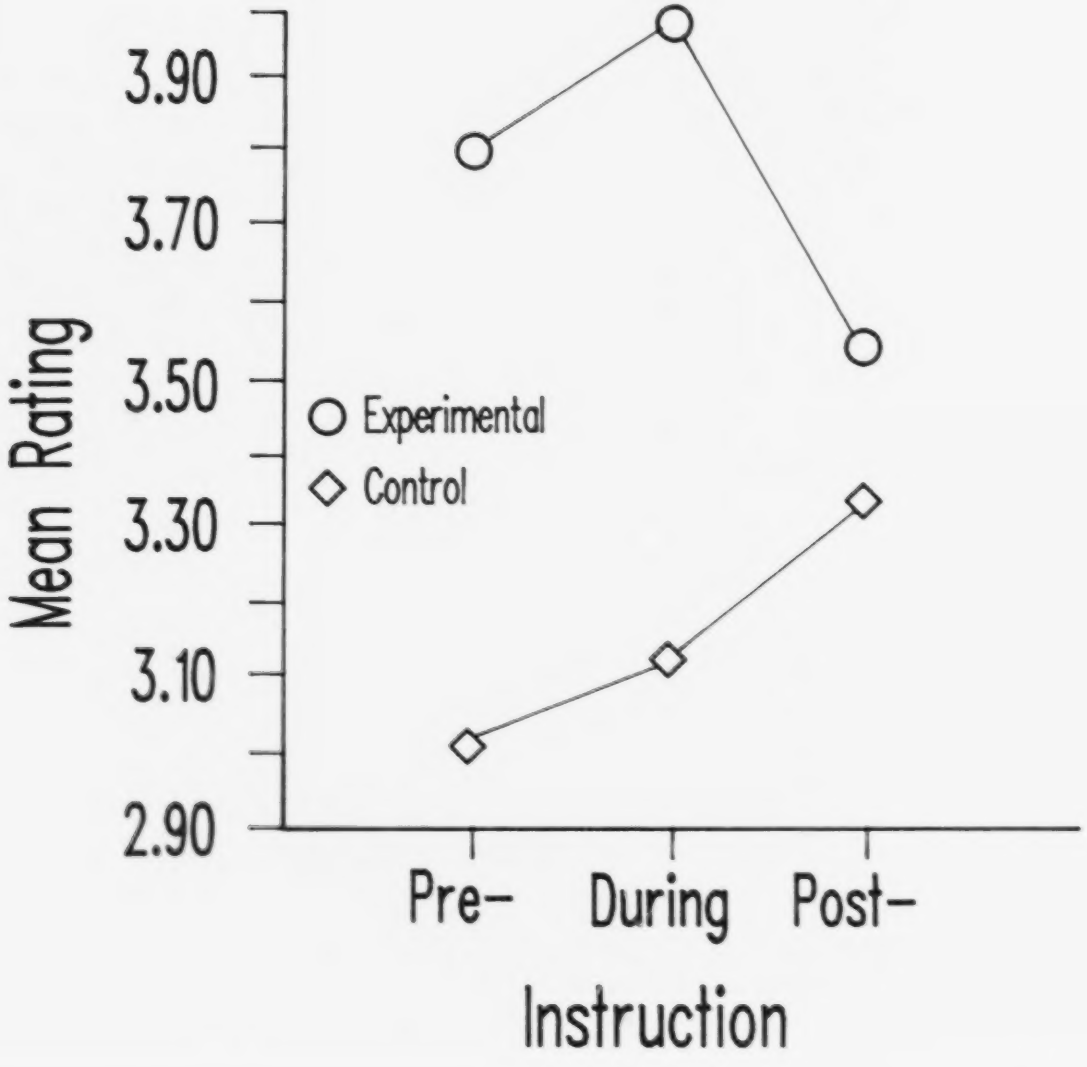
Formulating A Differential Diagnosis

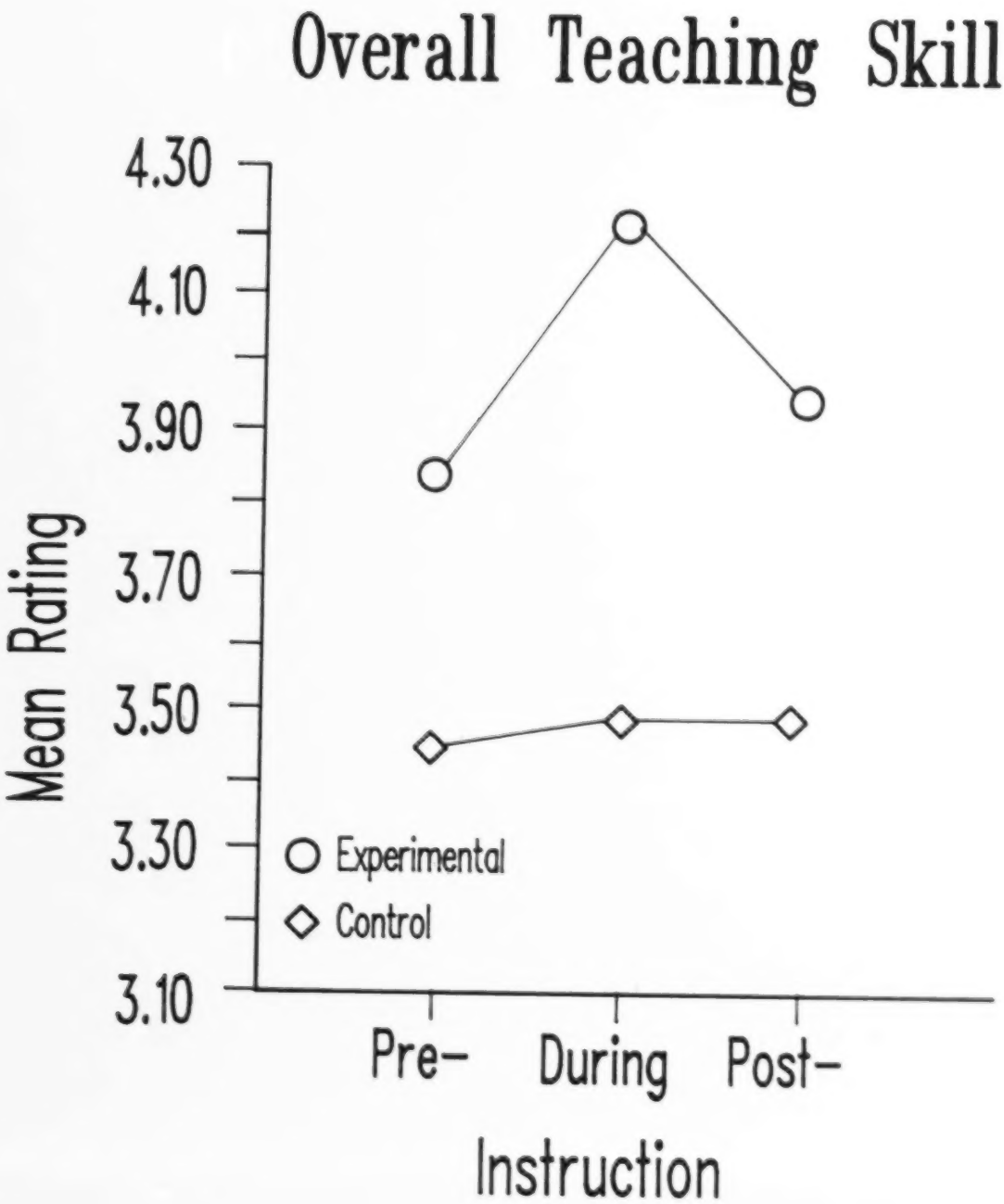



Communicating Objectives
3.30
2.90
2.50
2.10
1.70
1.30
0.90
Mean Rating
Experimental
Control
Pre-
During
Post-
Instruction

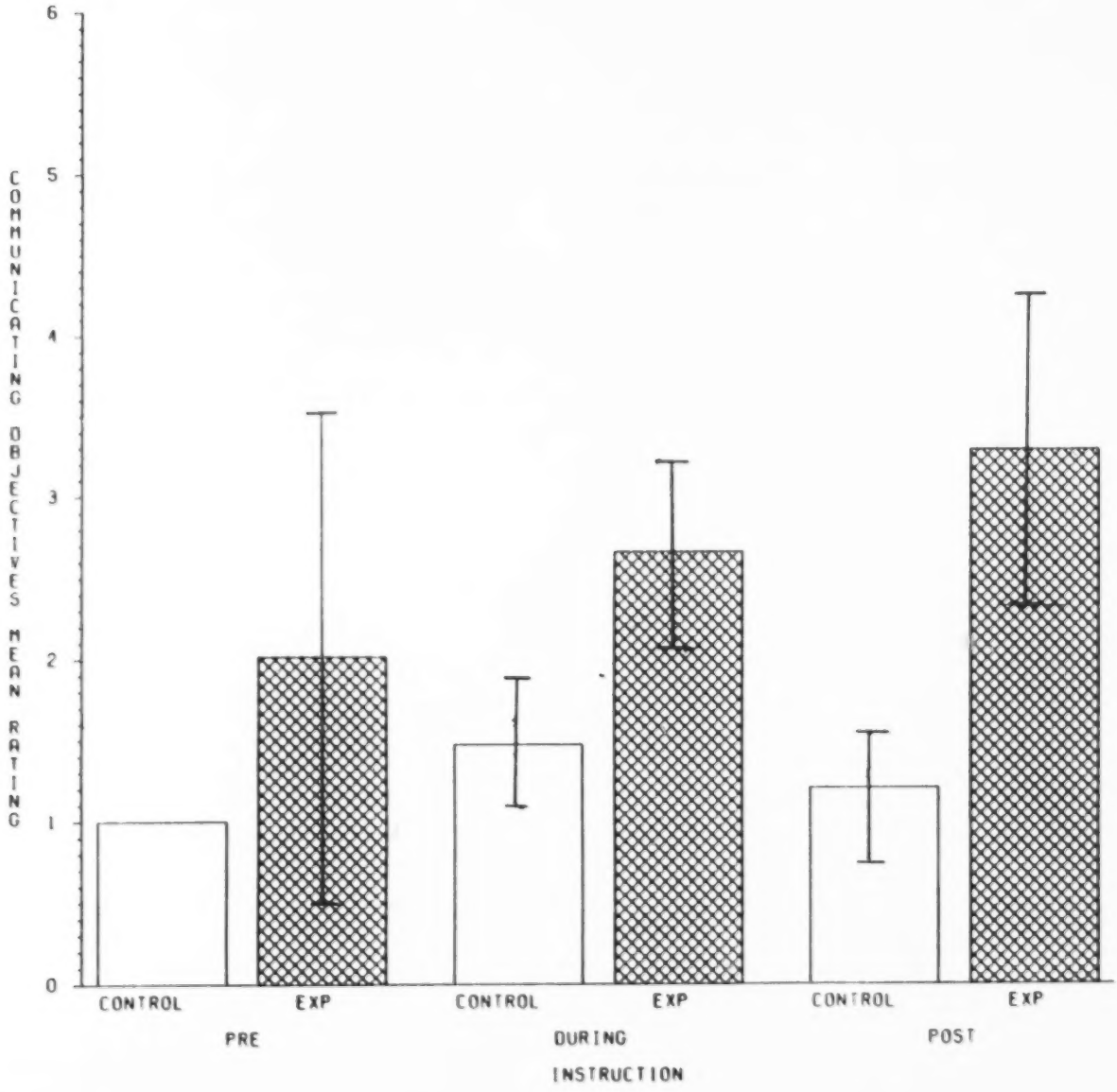

Directing Attention
4.10
3.90
3.70
3.50
3.30
3.10
Mean Rating
Experimental
Control
Pre-
During
Post-
Instruction

Expanding The Case




Overall Teaching Skill
4.30
4.10
3.90
3.70
3.50
3.30
3.10
Mean Rating
Experimental
Control
Pre-
During
Post-
Instruction

MEAN VIDEOTAPE RATING
OF EXPERIMENTAL AND CONTROL RESIDENTS
TEACHING SKILLS DURING THREE PHASES OF TRAINING
LOUISIANA STATE MEDICAL CENTER, NEW ORLEANS, 1984-86
COMMUNICATING OBJECTIVES



MEAN VIDEOTAPE RATING
OF EXPERIMENTAL AND CONTROL RESIDENTS
TEACHING SKILLS DURING THREE PHASES OF TRAINING
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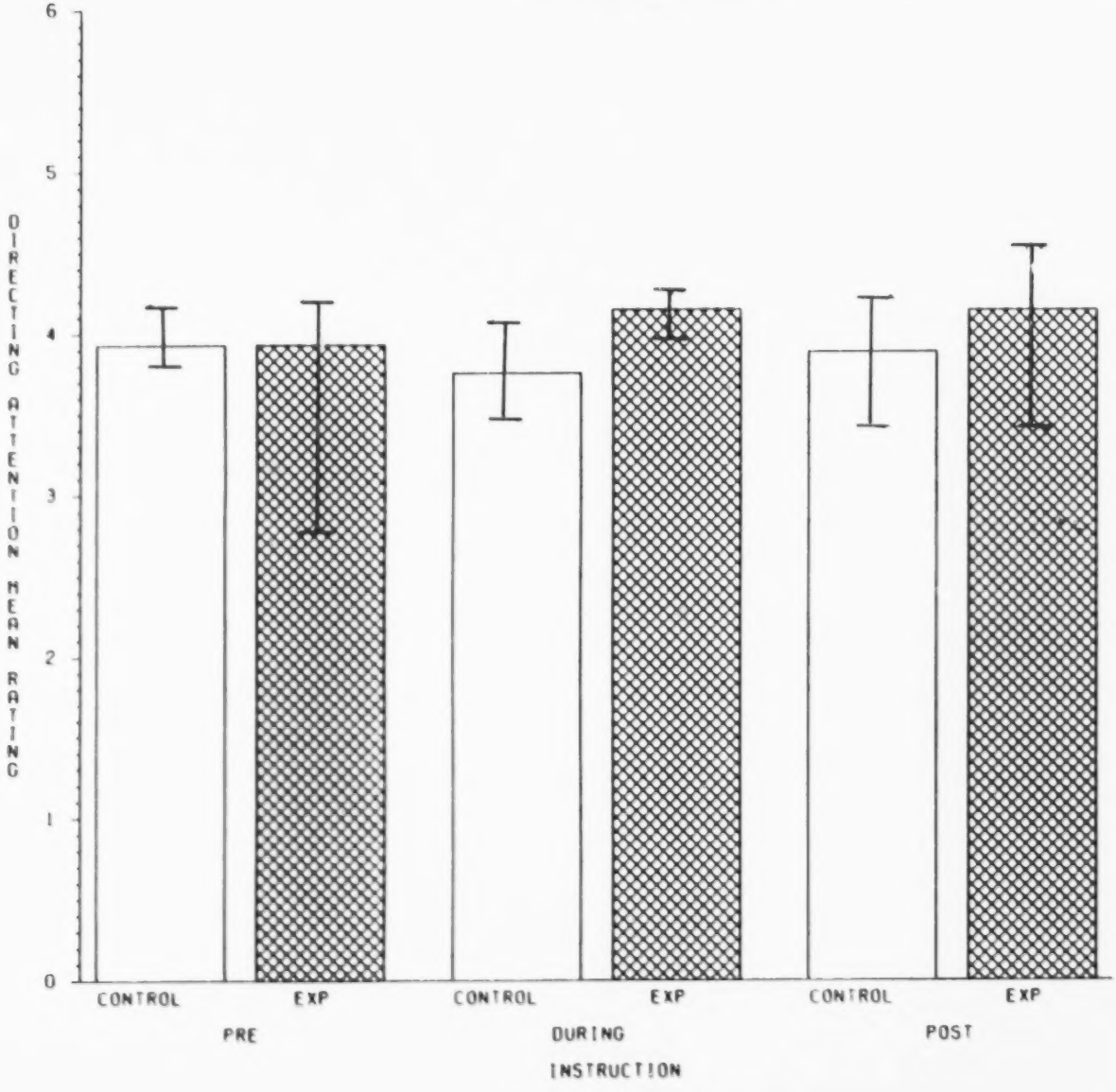
DIRECTING ATTENTION



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OF EXPERIMENTAL AND CONTROL RESIDENTS
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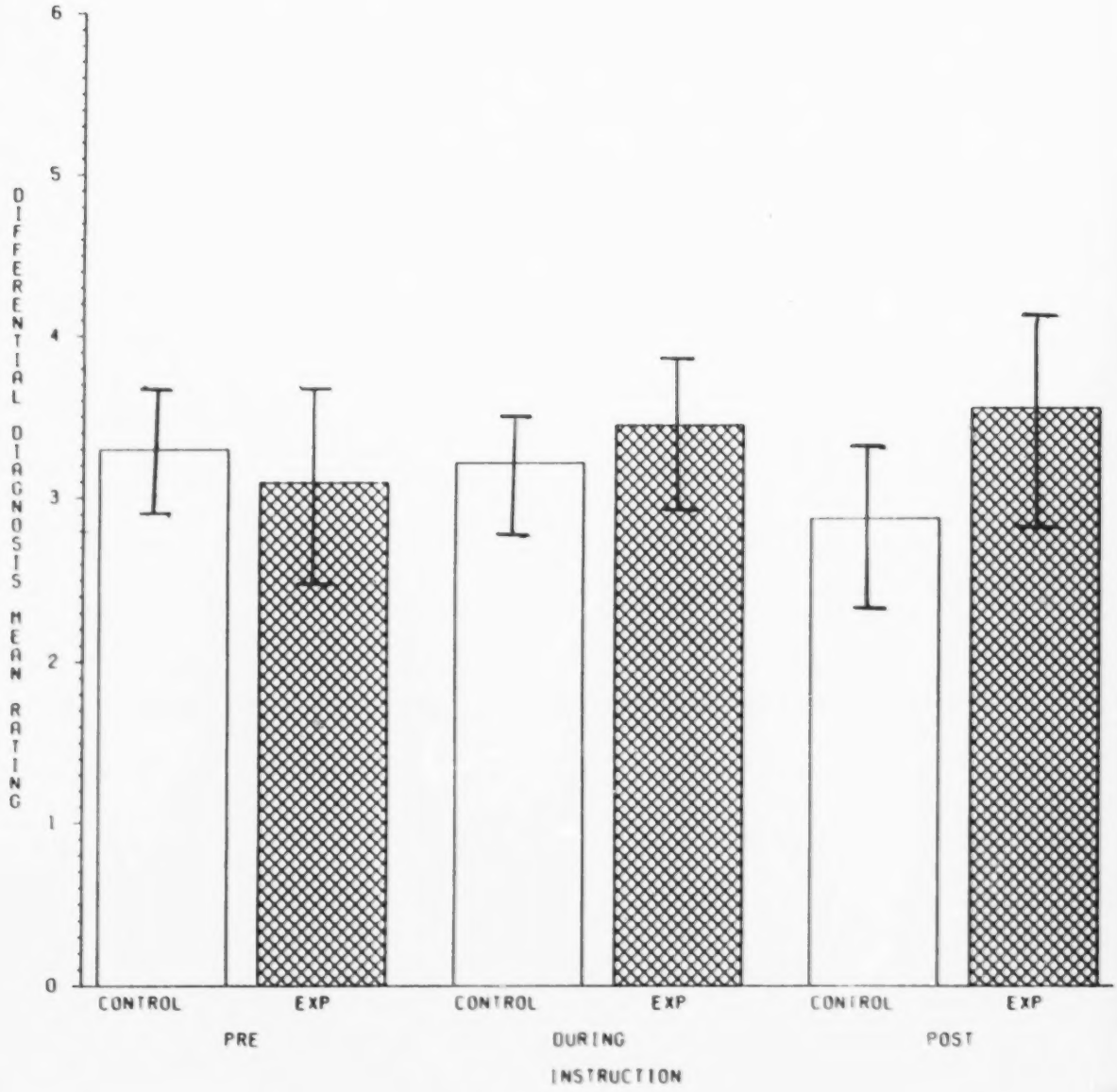
DIFFERENTIAL DIAGNOSIS



MEAN VIDEOTAPE RATING
OF EXPERIMENTAL AND CONTROL RESIDENTS
TEACHING SKILLS DURING THREE PHASES OF TRAINING
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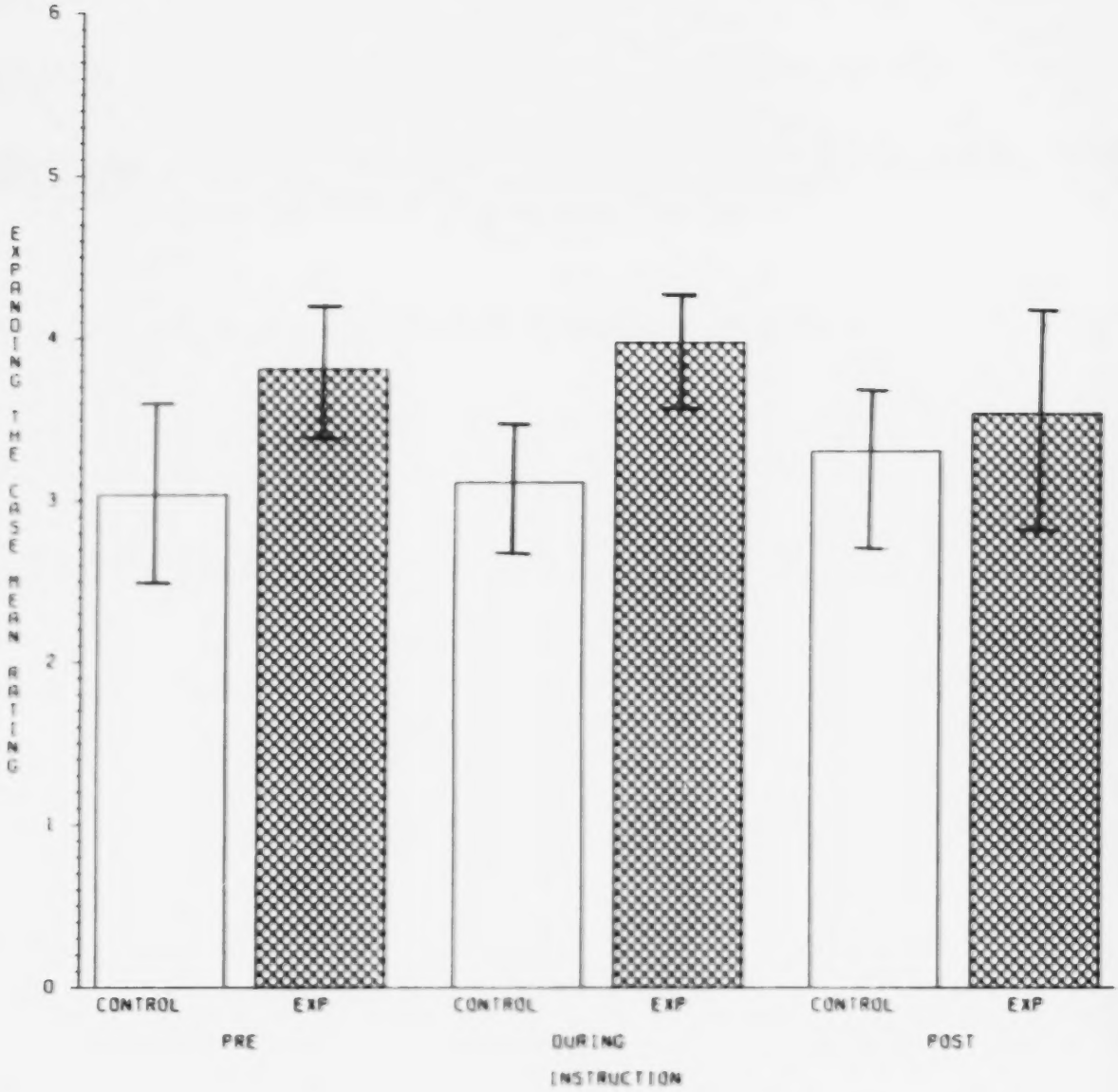
EXPANDING THE CASE



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TEACHING SKILLS DURING THREE PHASES OF TRAINING
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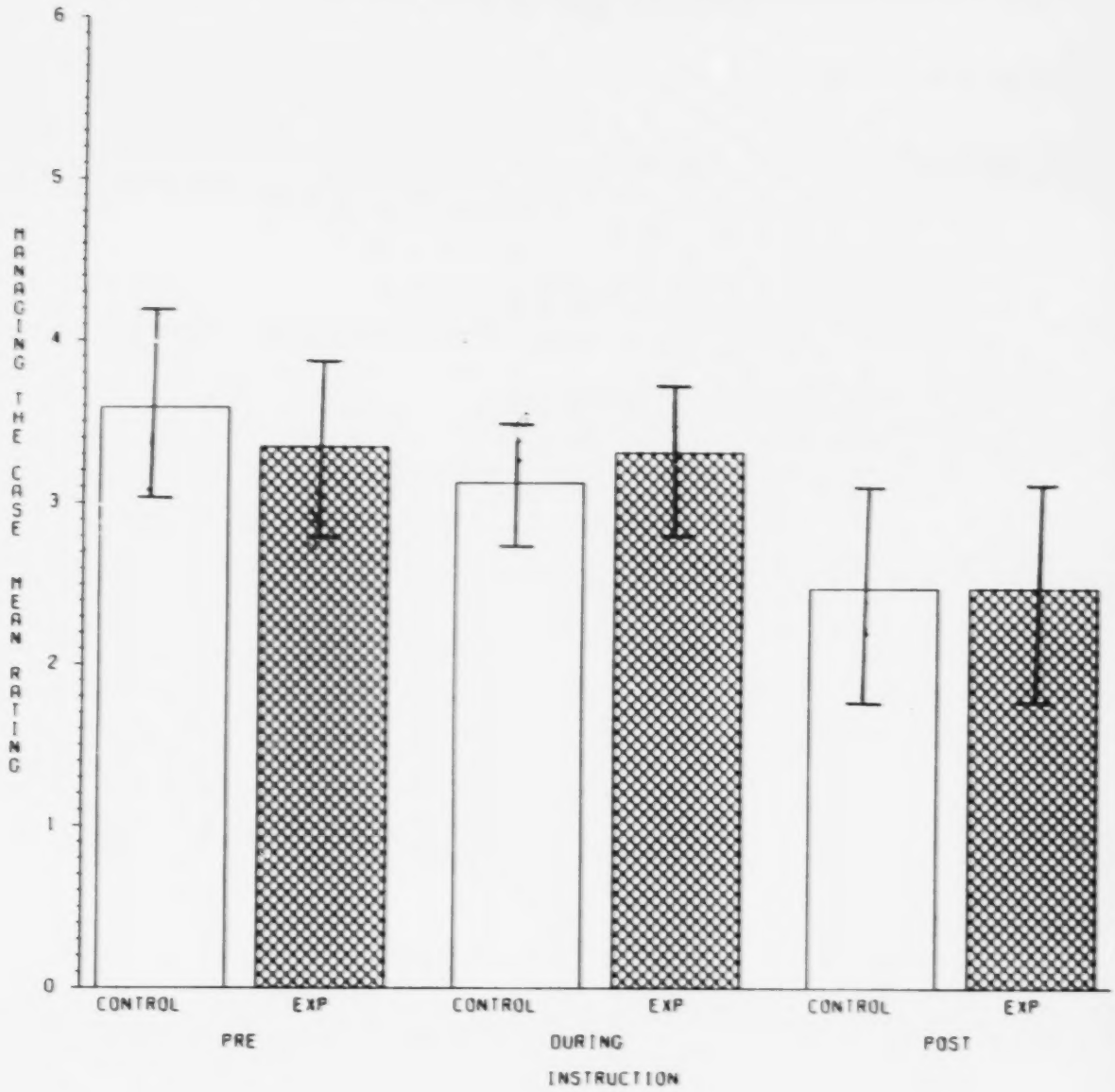
MANAGING THE CASE



MEAN VIDEOTAPE RATING
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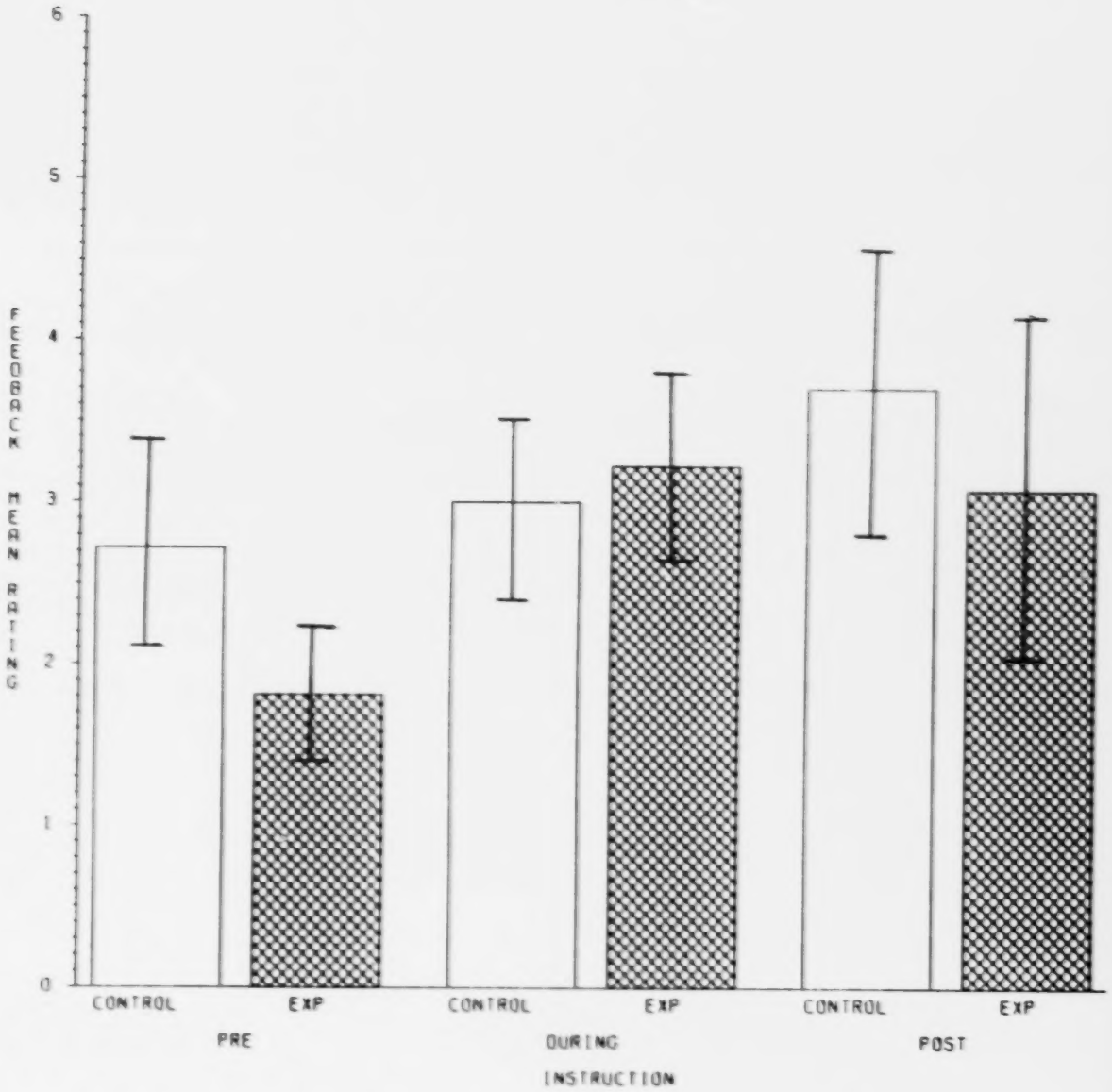
TEACHING SKILLS DURING THREE PHASES OF TRAINING
LOUISIANA STATE MEDICAL CENTER, NEW ORLEANS, 1984-86
FEEDBACK



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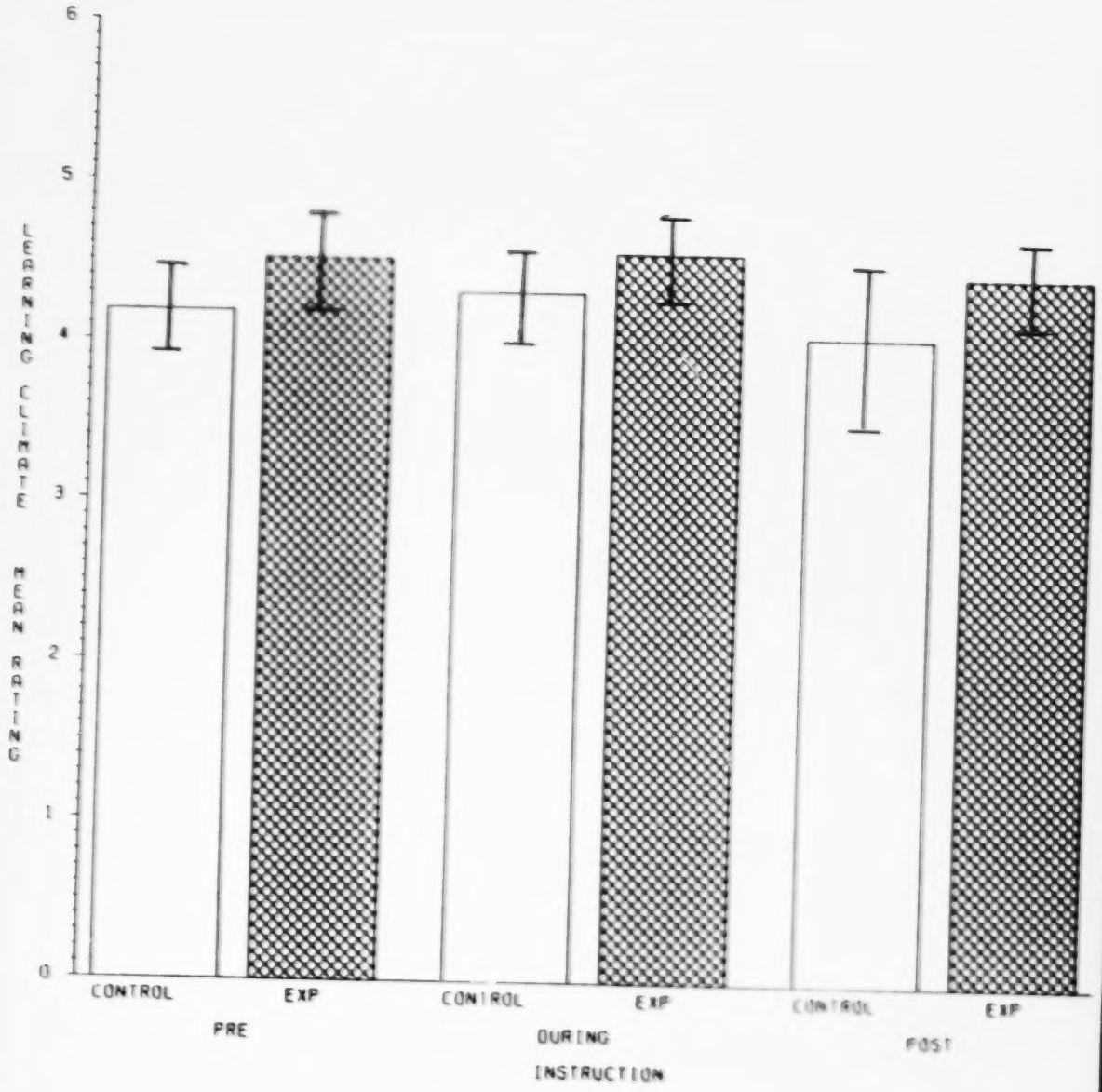
LEARNING CLIMATE



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